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INFORMATION ON COTTON INSECT CONTROL

When reference is made to cotton, and the losses due to cotton insects, everyone immediately thinks of lint. Too little recognition is given to the importance of linters and cottonseed. In the present war emergency, when the need for explosives and food is so great, the importance of linters for the manufacture of explosives, and of cottonseed as a source of food and feed, both in the form of oil and cake, becomes apparent. The annual production of approximately 1,000,000 bales of linters, 1,400,000,000 pounds of oil, 1,800,000 tons of meal and cake, and 1,000,000 tons of hulls should emphasize the importance of cotton aside from lint. Cottonseed oil is our most important source of edible oil, and cottonseed meal and cake are the principal protein concentrate feeds used for beef and milk production.

The actual loss due to cotton insects becomes apparent when the fact is revealed that on the average, for every 7 bales of lint or linters, boll weevil has taken 1 bale; for every 7 pounds of oil, boll weevil has taken 1 pound; and for every 7 tons of cottonseed cake, boll weevil has taken 1 ton. Much of this loss could have been prevented by treating those acres where the insect population was sufficiently high to warrant control measures. In general this would be only about one-third of the cotton acreage in the country. The affected farmers are paying heavily for their laxity in controlling their insects.

Boll weevil and other cotton insects can be controlled profitably by applying the control measures recommended by the Bureau of Entomology and Plant Quarantine and the State experiment stations. To effect the most economical control of cotton insects farmers must be helped to recognize conditions which warrant control measures. Insecticides should only be applied when the prospect of yield is more than one-third of a bale per acre, and the insect population, determined by count or careful observation, is sufficiently great to justify their application. To secure the best results the insect control program must be recognized as a year-round job and a community endeavor. The more the people know about the insects with which they are dealing, the more interest they will take in combating the pests.

Although general control measures are given in this leaflet, local conditions will influence these recommendations. In most States insecticides are applied by dusting but in some areas in the southeastern States mopping, followed by dusting, may be preferred. Recommendations must be localized also to include approved cultural practices.

The following tables give brief summaries of experiments and demonstrations which show the value of boll weevil control and the outlines suggest plans and procedures for leaders in conducting a year-round cotton insect control program.

BOLL WEEVIL CONTROL EXPERIMENTS
Bureau of Entomology and Plant Quarantine, U.S.D.A.

Each treated plot was compared with an adjacent untreated check. The treated plots were dusted with calcium arsenate after 10 percent of the squares were infested.

Summary of 375 experiments at Tallulah, La.

| <u>Year</u> | <u>Pounds seed cotton per acre</u> | | | <u>Percent</u> |
|-------------|------------------------------------|---------------|-------------|-----------------|
| | <u>Check</u> | <u>Dusted</u> | <u>Gain</u> | <u>Increase</u> |
| 1920 | 847 | 1,125 | 278 | 32.8 |
| 1921 | 973 | 1,407 | 434 | 44.6 |
| 1922 | 598 | 1,100 | 502 | 83.9 |
| 1923 | 1,134 | 1,369 | 235 | 20.7 |
| 1924 | 950 | 960 | 10 | 1.1 |
| 1925 | 1,974 | 2,204 | 230 | 11.7 |
| 1926 | 1,087 | 1,829 | 742 | 68.3 |
| 1927 | 1,255 | 1,669 | 414 | 33.0 |
| 1928 | 971 | 1,371 | 400 | 41.2 |
| 1929 | 1,488 | 1,662 | 174 | 11.7 |
| 1930 | 1,131 | 1,236 | 105 | 9.3 |
| 1931 | 1,885 | 2,484 | 599 | 31.8 |
| 1932 | 1,251 | 1,823 | 572 | 45.7 |
| 1933 | 911 | 1,330 | 419 | 46.0 |
| 1934 | 1,212 | 1,448 | 236 | 19.5 |
| 1935 | 1,349 | 1,502 | 153 | 11.3 |
| 1936 | 2,195 | 2,305 | 110 | 5.0 |
| 1937 | 2,341 | 2,419 | 78 | 3.3 |
| 1938 | 1,968 | 2,156 | 188 | 9.6 |
| 1939 | 1,950 | 2,171 | 221 | 11.3 |
| 1940 | 1,008 | 1,559 | 551 | 54.7 |
| 1941 | 983 | 1,438 | 455 | 46.3 |
| Average | 1,339 | 1,662 | 323 | 24.1 |

Summary of 60 experiments at Florence, S. C.

| <u>Year</u> | <u>Pounds seed cotton per acre</u> | | | <u>Per acre per season</u> | |
|-------------|------------------------------------|---------------|-------------|--------------------------------------|---------------------------------|
| | <u>Check</u> | <u>Dusted</u> | <u>Gain</u> | <u>*Cost of</u> <u>Treatments</u> | <u>Profit</u> <u>or Loss</u> |
| 1928 | 439 | 664 | 225 | \$5.04 | \$15.66 |
| 1929 | 686 | 1,168 | 482 | 5.02 | 29.57 |
| 1930 | 1,060 | 1,416 | 356 | 3.66 | 14.82 |
| 1931 | 793 | 1,113 | 320 | 3.88 | 5.78 |
| 1932 | 766 | 941 | 175 | 1.60 | 3.73 |
| 1933 | 804 | 987 | 183 | 2.45 | 4.33 |
| 1934 | 1,664 | 1,762 | 98 | 1.27 | 3.00 |
| 1935 | 843 | 1,212 | 369 | 5.31 | 9.56 |
| 1936 | 1,829 | 1,988 | 159 | 3.78 | 3.52 |
| 1937 | 1,082 | 1,162 | 80 | 3.78 | -0.42 |
| 1938 | 677 | 1,199 | 522 | 3.95 | 12.73 |
| 1939 | 899 | 1,239 | 340 | 4.31 | 6.57 |
| **1940 | - | - | - | - | - |
| 1941 | 390 | 803 | 413 | 6.12 | 15.99 |
| Average | 918 | 1,204 | 286 | 3.86 | 9.60 |

* The cost of treatments was based on the prevailing prices of materials and labor for each season.

** In 1940 scarcity of boll weevils prevented experiments.

BOLL WEEVIL CONTROL DEMONSTRATIONS 1941

In Chambers County, Ala., in 1941, a rather intensive boll weevil control program was initiated by H. F. McQueen, County Agent. As a result, approximately 70 percent of all cotton was dusted to some extent, and some 250 tons of calcium arsenate was used. In an effort to compare results to determine the effectiveness of proper use of calcium arsenate dust, records were secured from 28 farmers; of these 5 were demonstrators and 6 applied no poison. The following table presents somewhat of a summary of the profitable returns to farmers who did an excellent job of dusting with calcium arsenate, as compared with those who did no boll weevil control, and others who just spread poison.

| | <u>Average No.</u> <u>applications</u> | <u>Yield</u> <u>pounds</u> <u>lint</u> | <u>Per acre</u> <u>cost of</u> <u>control</u> | <u>Increased yield</u> <u>from weevil</u> <u>control</u> | <u>Per acre</u> <u>value of</u> <u>extra cotton</u> |
|---------------|---|--|---|--|---|
| Demonstrators | 7.1 | 333 | \$2.45 | 252 lbs. | \$41.58 |
| No poison | 0 | 81 | 0 | 0 lbs. | 0 |
| Others | 2.4 | 119 | 1.07 | 38 lbs. | 6.27 |

Cameron Siddall, Extension Entomologist of Texas, reports on cotton insect control by 20 demonstrators, representing a cross section of the cotton farms of the State. An average of 13.1 acres was dusted with calcium arsenate, sulfur, or a mixture of the two, and 3.8 acres were left as checks. The demonstrators averaged four applications of dust, and after deducting the cost of picking and ginning the extra cotton, made a profit of \$8.45 per acre.

| | <u>Average No.</u> <u>applications</u> | <u>Pounds seed cotton per acre</u> | | | <u>Per acre, per season</u> | |
|------------------|---|------------------------------------|---------------|-------------|------------------------------------|---------------|
| | | <u>Check</u> | <u>Dusted</u> | <u>Gain</u> | <u>Cost of</u> <u>treatment</u> | <u>Profit</u> |
| 20 demonstrators | 4 | 506 | 714 | 208 | \$3.24 | \$8.45 |

In McLennan County, Tex., in 1941, there were widespread infestations of boll weevils, bollworms, and leaf worms. The business interests of Waco, Tex., were instrumental in securing an entomologist to assist the county agent in a program of cotton insect control. Reports of the yields of seed cotton, the value of the increased production, cost of control, and the net profits of 21 farmers growing 1,506 acres of cotton were tabulated by County Agent J. C. Patterson. In most reports the increased yields were based on conservative estimates.

| | <u>Total</u> | <u>Per acre</u> |
|--|--------------|-----------------|
| Pounds increase of seed cotton..... | 383,800 | 255 |
| Value of increased production of lint and seed..... | \$28,432 | \$18.88 |
| Cost of increased production, materials, and labor..... | \$ 3,587 | \$ 2.38 |
| Cost of picking and ginning increased production..... | \$ 5,181 | \$ 3.44 |
| Net returns from dusting..... | \$19,664 | \$13.06 |

COTTON INSECT CONTROL
General Recommendations

1. Follow all approved cultural and sanitary practices.
2. Examine cotton once each week or oftener for insect damage.
3. Dusting pays when cotton is capable of producing more than 1/3 bale per acre and insects are threatening.
4. Dusting may be done any time, day or night, when the air is calm, whether or not plants are wet with dew.

Boll weevil control

1. When 10 to 15 squares out of 100 on small cotton or 25 squares out of 100 on rank cotton are punctured, begin dusting.
2. Dust with 5 to 7 pounds of calcium arsenate per acre every 4 or 5 days until weevils are brought under control or crop of bolls is set.
3. Repeat the application if it is rained off within 24 hours.
4. Three to five applications at 4- or 5-day intervals are usually sufficient to set a crop. One to three later applications may be needed for boll protection.
5. In certain of the Southeastern States presquare mopping or dusting may be a useful practice in boll weevil control.

Cotton aphid

Aphids (plant lice) can be prevented from increasing to injurious numbers by adding 2 percent nicotine to alternate applications of calcium arsenate, or 1 percent nicotine to each application of calcium arsenate. Nicotine gives best results when plants are dry and temperature is high.

Cotton flea hopper

1. If young cotton is not squaring freely, examine the tips of the plants for flea hoppers.
2. When 20 flea hoppers are present on the terminal buds of 100 plants, begin dusting.
3. Apply 12 to 18 pounds of dusting sulfur per acre at 5- to 7-day intervals, depending upon the severity of the infestation. Repeat the application if washed off within 24 hours. Two or three applications are usually sufficient.
4. A mixture of one part of calcium arsenate and 2 parts of sulfur should be used at the rate of 12 to 15 pounds per acre when both flea hopper and boll weevil are present.

Bollworm

1. Eggs or newly hatched worms on terminal buds indicate time to start dusting at once. Large worms are difficult to kill.
2. Dust with 8 to 10 pounds of calcium arsenate, arsenate of lead, or cryolite, per acre, at 5-day intervals. Several applications may be needed.
3. Adjust nozzles of dusting machine so that the tops of plants are well covered with dust.

Cotton leafworm

Cotton leafworm may be controlled by dusting or spraying with any of the arsenical insecticides.

SUGGESTED CALENDAR OF WORK
for
LEADERS IN COTTON INSECT CONTROL

I. Spring Program

- A. Survey of boll weevil survival
- B. District conferences
- C. Delineate threatening areas
- D. Get out publicity on:
 - 1. Selection of fields and preparation of soil
 - 2. Selection of proper varieties
 - 3. Early planting (after danger of frost is over)
 - 4. Treating seed
 - 5. Desirability of close spacing and proper fertilization
 - 6. Winter survival of boll weevil and other insects
 - 7. Repairing or securing dusting equipment
 - 8. Locating supply and securing portion of insecticides
- E. Select demonstrators
- F. Complete farmer organization
- G. Announce demonstrators
- H. Announce cooperators: Ginners, crushers, merchants, bankers, farm organizations, civic organizations, farmers

II. Summer Program

- A. Surveys
 - 1. Presence and abundance of insects in fields
 - 2. Further delineate threatening areas in State, county, and farm
- B. Publicity on A
- C. Demonstrations on making insect counts to show when to apply insecticides
- D. Lay out demonstration plots
- E. Publicity on time and place of demonstration
- F. Demonstrate on mopping and/ or dusting
- G. Check on aphids, leaf worm, bollworm
- H. Show life stages of insects, in the press, in exhibits, in the field
- I. Publicize G
- J. Observe conditions under which insecticides are being applied
- K. Field meetings to show:
 - 1. Location and amount of fruit - on check on dusted
 - 2. Life stages of insects
 - 3. Conditions under which insecticides are being applied

III. Fall Program

- A. Field meetings to show:
 - 1. Comparative yields
 - 2. Possibility of drawing wrong conclusions
 - 3. Presence of insects
 - 4. Need for fall destruction of stalks
 - 5. Method of destroying stalks
- B. Publicize A
- C. Record results of demonstration plots
- D. Check field results
- E. Check on fall destruction of stalks
 - 1. Methods of destruction
 - 2. Earliness of destruction
 - 3. Completeness of destruction
- F. Publicize the progress of E

IV. Winter Program

- A. Summarize demonstrational information
- B. Prepare teaching material
- C. Get out publicity on:
 - 1. Selecting and procuring proper varieties of seed
 - 2. Repairing or procuring dusting equipment
 - 3. Farm plans -- selection of fields
 - 4. Organization -- need for everybody cooperating
 - 5. Winter meetings
- D. Winter meetings
 - 1. County agent and farm
 - 2. Commercial and civic groups
- E. Organize

SUGGESTED
CALENDAR OF WORK
for
FARMERS ON COTTON INSECT CONTROL

I. Spring

- A. Secure proper varieties of seed, if not already on hand
- B. Secure fertilizers and at least portion of insecticides
- C. Treat seed
- D. Prepare soils properly
- E. Space close in planting and fertilize properly
- F. Plant as early as possible after danger from frost is past
- G. Be on lookout for insect pests and report presence
- H. Serve as demonstrators or attend demonstration meetings
- I. Encourage neighbor participation

II. Summer

- A. Attend demonstration meetings
- B. Make counts of insect populations
- C. Follow recommendations based on experimental results

II. Summer (continued)

- D. Study insect population, weather, and possible yield
- E. Dust for boll weevil and flea hopper when population warrants
- F. Dust for aphids, leaf worm, and bollworm when population warrants
- G. Observe and study yields of dusted and undusted cotton

III. Fall

- A. Pick cotton early
- B. Note yield on dusted and undusted cotton
- C. Kill all growing cotton plants immediately after cotton is picked
 - 1. Encourage neighbors to do likewise

IV. Winter

- A. Attend meetings
- B. Help organize
- C. Repair or secure dusting equipment
- D. Secure proper varieties of seed
- E. Select suitable fields

The brief recommendations that follow are very general and cover important points to be considered in cotton insect control. Further details and local modifications of these recommendations may be procured from your county agent, State Extension Service, State Experiment Station, or the United States Department of Agriculture.

EXTENSION PROCEDURE
in
COTTON INSECT CONTROL

I. Methods

- A. Surveys almost a year-round proposition
 - 1. General, made by entomologist
 - a. Fall surveys on abundance of boll weevil
 - b. Spring surveys of
 - (1) Percentage of survival, hibernation cage records
 - (2) Percentage of survival, field observations
 - c. Early summer surveys
 - (1) "Build-up" of fleahoppers or boll weevil in States
 - (2) Delineate threatening areas
 - d. Summer surveys
 - (1) Observe conditions under which control measures are being applied
 - (2) Check build-up of aphids, bollworm, or other insects
 - e. Fall surveys
 - (1) Check demonstration plots to observe effectiveness of control
 - (2) Check field control results to observe effectiveness of control
 - (3) Check on effectiveness of fall destruction of cotton stalks

- I. Methods (continued)
 - A. 2. Local surveys, to be made by farmers and county agents after they have been trained by entomologist on insect populations.
 - a. To show need for applying insecticides
 - b. To show portion of field infested
 - c. To show amount of insecticides necessary
 - d. To show time to begin applying insecticides
 - e. To show time to stop applying insecticides
 - B. Meetings
 1. Winter
 - a. Report results of surveys
 - b. Biology of insects as it relates to control
 - c. Dovetail cultural control with farm practices
 - d. Discuss insecticidal control
 - e. Discuss results of demonstrations
 - f. Results of experimental work
 - g. Organize
 2. Crop growing season
 - a. In field point out life stages of insects
 - b. In field point out effects of different control measures
 - C. Training schools
 1. Representatives of commercial agencies
 - a. Insecticide manufacturers and dealers
 - b. Ginners
 2. Other governmental agencies
 - a. F.S.A. - A.A.A. - S.C.S.
 3. County agent leaders and district agents
 4. County agricultural agents
 5. Local leaders, both adult and junior
 - D. Demonstrations
 1. Method and technique
 - a. In making insect-population counts
 - b. In interpreting and applying information
 - c. In stalk destruction
 - d. In mixing insecticides
 - e. In applying insecticides
 2. Result demonstrations
 - a. To show value of applying control measures
 - b. To show value of timing control measures
 - c. To prevent farmers from drawing wrong conclusions from casual field observations
 - E. Preparation and use of teaching tools
 1. Written and printed matter
 - a. Personal letters in reply to specific requests
 - b. Circular letters
 - (1) Plans for programs, or campaigns
 - (2) General information on use of insecticides to be followed by timely cards, telephone, telegraph, or radio messages

- I. Methods (continued)
 - E. 1. c. Mimeographed or multigraphed matter
 - (1) Narrative subject matter
 - (2) Descriptive material - charts, graphs, drawings, sketches
 - d. Posters
 - e. Bulletins, circulars, stuffers
 - f. Press releases
 - g. Radio
 - (1) Awaken interest
 - (2) Disseminate timely information
 - h. Exhibits
 - (1) General
 - (a) Awaken interest
 - (b) Impart subject-matter information
 - (2) Specific
 - (a) Local to show actual emergence of particular insect
 - (b) How to do definite job
 - (3) Portable
 - (a) Insect collections for reference in identification
 - (b) Mounts of insect life histories and damage, to be used by local leaders
 - (c) Models of insects
 - i. Motion pictures, slides, film strips

- II. Personnel or agencies used
 - A. Junior organizations
 - 1. Future Farmers of America
 - 2. Scouts
 - 3. 4-H
 - a. Camps or short courses
 - b. Activities
 - c. Projects
 - d. Demonstrations - team, method, result
 - e. Contests
 - B. Commercial agencies (training schools primarily)
 - 1. Insecticide manufacturers and jobbers
 - a. Field men
 - b. Seed and supply houses
 - c. Farm supply houses (cooperatives)
 - d. Cotton ginner and oil crushers
 - e. Ginners
 - C. Farmer organizations
 - 1. Farm bureaus
 - 2. Grange
 - 3. Farmers' unions
 - 4. One-variety cotton associations
 - 5. Marketing associations

II. Personnel or agencies used (continued)

D. Extension agencies

1. Related subject-matter specialists
 - a. Cotton specialists
 - b. Extension agronomists
 - c. Extension agricultural engineers
 - d. Extension foresters
 - e. Extension entomologists
 - f. County agent leaders
 - g. County agents and club agents
 - h. Local leaders, adult and junior

E. Civic organizations

1. Scouts
2. Kiwanis
3. Rotary
4. Lions
5. Better Business Bureaus

F. Religious groups

G. Governmental other than Extension or Entomology

1. Action agencies
 - a. Agricultural Adjustment Administration
 - b. Soil Conservation Service
 - c. Farm Security Administration
 - d. Agricultural Marketing Service
 - e. Federal Crop Insurance Corporation
 - f. Bureau of Agricultural Economics
 - g. Farm Credit Administration
 - h. Agricultural Education Service, U. S. Office of Education
2. Research Bureaus
 - a. Bureau of Plant Industry
 - b. Bureau of Agricultural Chemistry and Engineering
 - c. Forest Service